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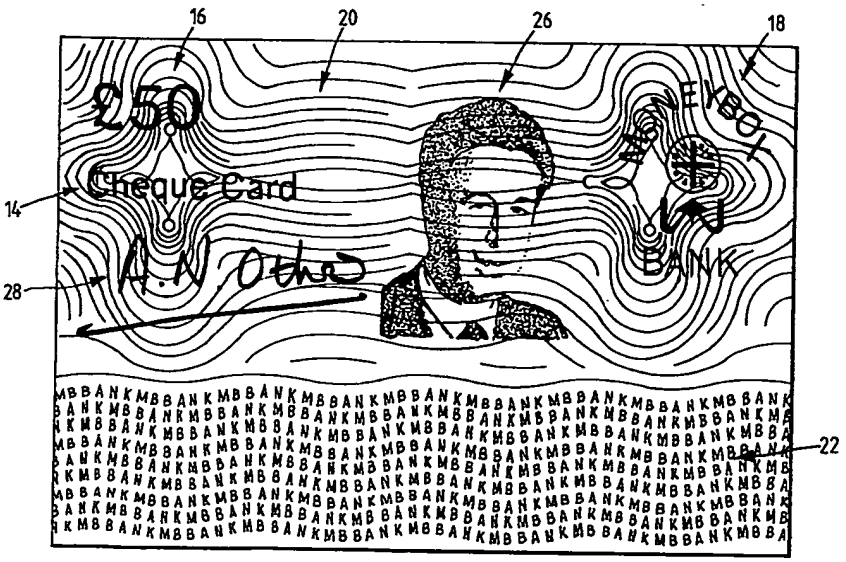
(71) Applicant Metal Box plc, (United Kingdom), Queens House, Forbury Road, Reading RG1 3JH, Berkshire.
(72) Inventors Leonard William Reed, Christopher John Edwards.
(74) Agent and/or Address for Service R. G. C. Jenkins & Co., 12-15 Fetter Lane, London EC4A 1PL.

(54) **Identity card**

(57) There is provided an identity card in which anti-counterfeit features such as security patterns 20 and 22 and an image of the person and the signature of a cardholder 26 and 28 respectively are applied to the same surface of a plastics base layer of the card. The images 26 and 28 are applied using a scanning laser engraver which damages and discolours the plastics to form the images so that the images form an integral part of the structure of the card and are also closely associated with the printed security patterns. The images may also be formed, in this manner, after the front surface of the card has been covered by a transparent protective layer of plastics or lacquer, so that the basic physical structure of the card can be completed prior to the application of the images within the card. A method for the preparation of identity cards is also disclosed.

Fig.1.



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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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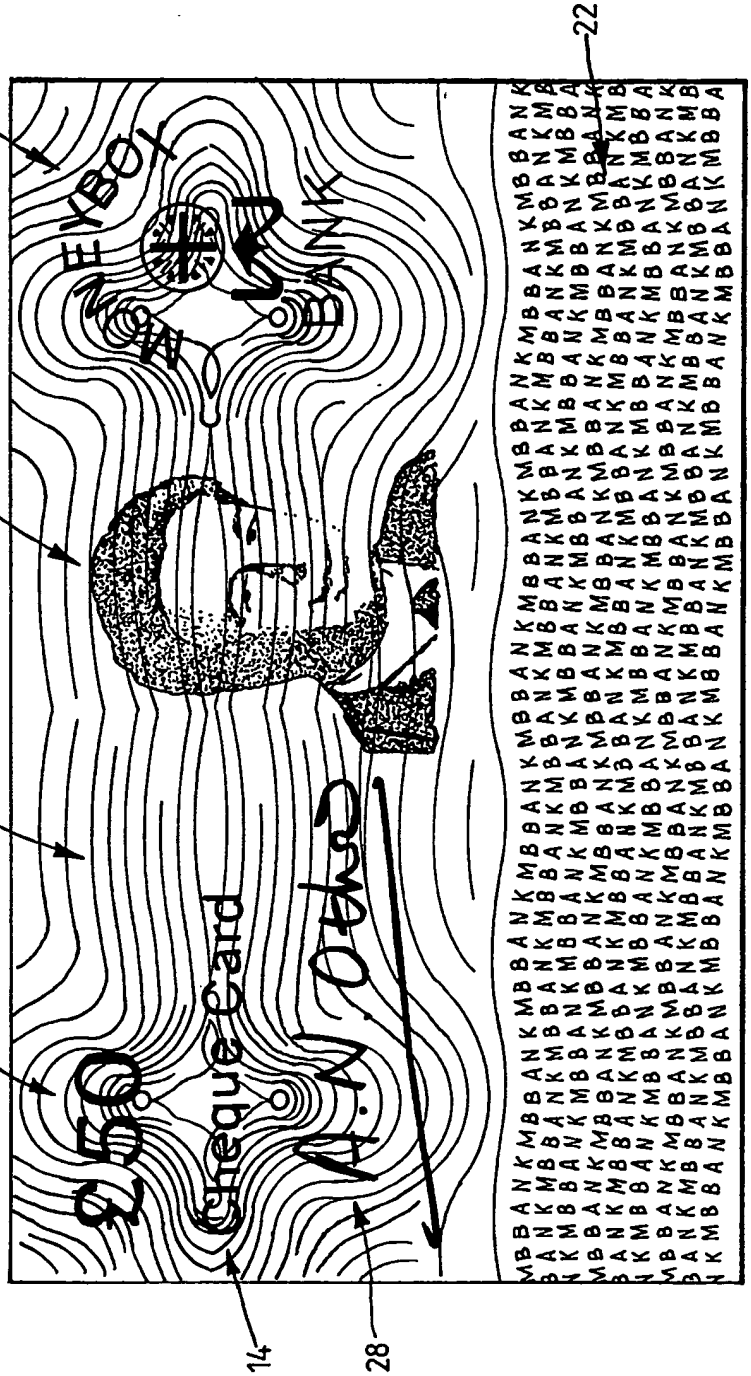
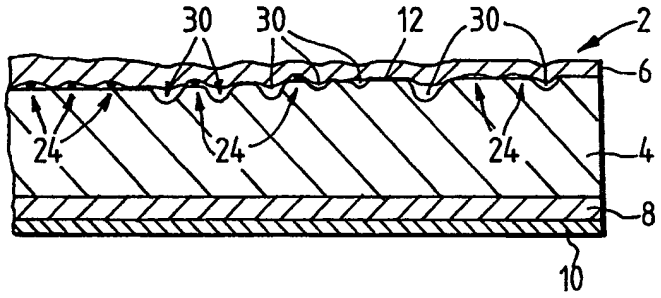


Fig. 1.

Fig. 2.



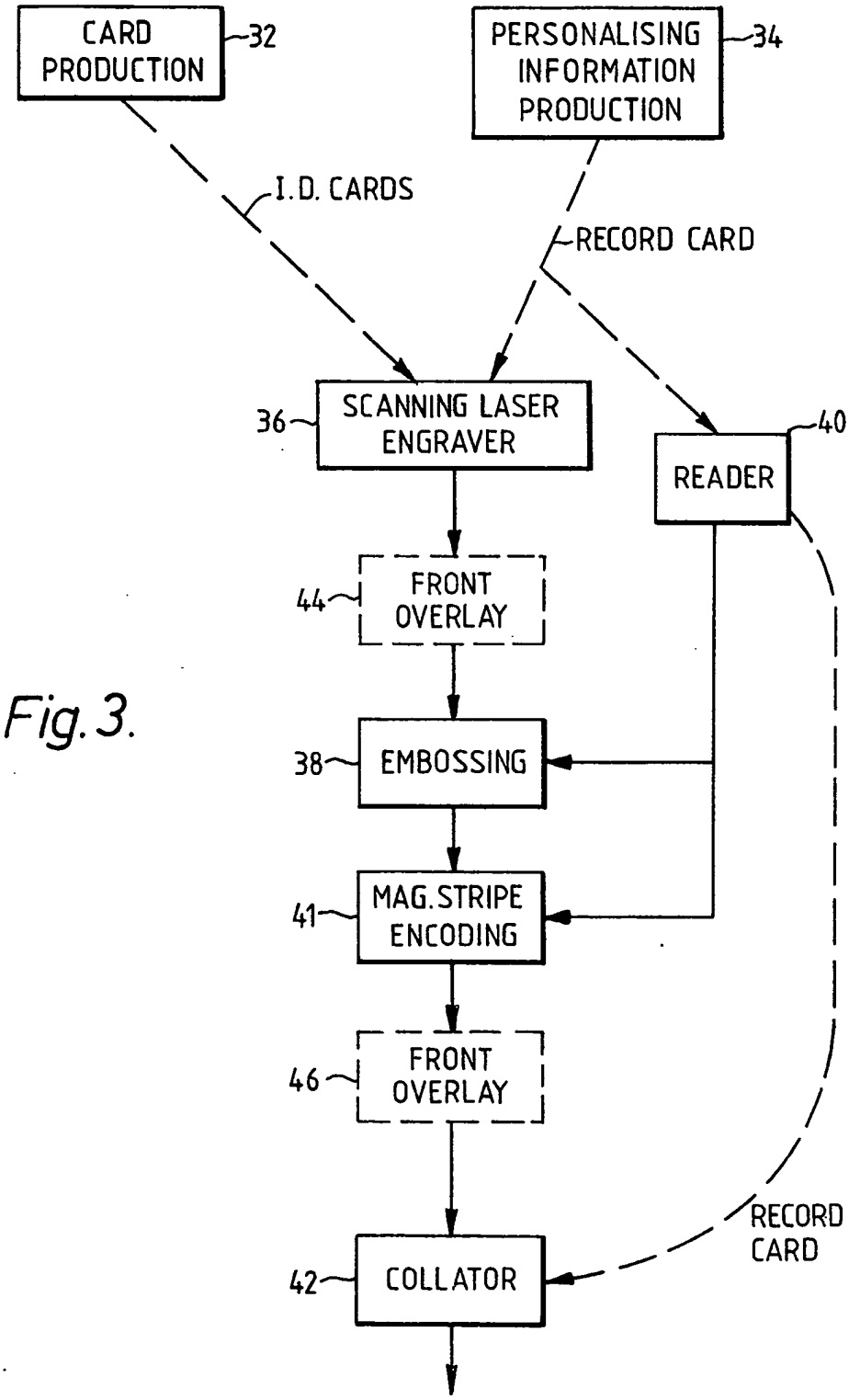

CARD PRODUCTION
32
PERSONALISING INFORMATION PRODUCTION
34
I.D. CARDS
RECORD CARD
36
SCANNING LASER ENGRAVER
40
READER
44
FRONT OVERLAY
38
EMBOSSING
41
MAG.STRIPE ENCODING
46
FRONT OVERLAY
RECORD CARD
42
COLLATOR

Fig. 3.

SPECIFICATION

Identity cards and methods of preparing them

This invention relates to identity cards and methods of preparing them. The term identity card is used herein to indicate any type of card which carries information intended to relate the card specifically to an individual who is making use of it. Examples of such cards are cheque guarantee cards, credit cards and identity cards employed to identify individuals in for example establishments where security rules operate.

Because of their intended function, it is important that such cards be as difficult as possible to alter or counterfeit and, in the case of alteration that any attempts at alteration subsequently be evident from the appearance of the card. For economy and security, it is also desirable that they should have a form of construction which enables all the manufacturing steps which will be identical for every card to be carried out at a single location on high-speed machinery, leaving only the application of personalising information which will differ from card to card to be done on a more localised basis using less expensive equipment.

Various kinds of personalising information may be applied to identity cards but the present invention is primarily but not exclusively concerned with cards in which the personalising information at least includes a picture or representation of the cardholder.

Various kinds of identity cards which carry pictures of the cardholder are already well known. In the majority of them, the picture is a photograph formed on a layer which physically is separate from (i.e. not integral with) a base or core layer of plastics material which forms the major physical component of the card. Such cards can be made quite difficult to counterfeit by the inclusion of various kinds of security printing, on the card in addition to the photograph but they offer only a low level of security because with care and patience it is possible to gain access to the photograph layer and substitute for it a different one, even when the photograph layer is protected by a transparent protective layer of for example plastics laminated to the front of the card or of lacquer applied to the front of the card.

It has been proposed to intimately relate with each other security printing and a photograph of the cardholder as for example in British Patent Specification No. 1,548,588 so that attempts to alter the photograph cause detectable disturbance of the security printing. However, in that particular case, the process employed required the personalising information to be applied prior to the finishing of the physical structure of the card and accordingly all operations had to be carried out at a central high-speed production plant in order to achieve economy. Furthermore, the process described in that patent aimed to produce a card of heavy paperlike consistency which was not capable of being permanently embossed as is required for many types of identity cards such as cheque guarantee and credit cards.

In another earlier proposal, a patch of black coating material is applied to a while plastics base layer and a half-tone image of the cardholder is produced by a needle which penetrates the black coating at a large multitude of points over its area, the penetrations being to a depth determined by the tone required at that particular point. If, for added security, security printing is applied to the base card prior to the black layer, then the security printing throughout the entire area of the image becomes either hidden or removed during the image-forming process so that a degree of security is lost. Furthermore, if, as is usually the case, a protective layer over the image is required this cannot be applied until after the personalising information has been applied to the card. This adversely affects the economics of production of that type of card which in any event are not particularly good since the process for producing the half-tone image takes approximately 1½ minutes per card.

An object of the present invention is to provide an identity card which gives very high security and can be economically produced.

From one aspect, the invention provides an identity card carrying personalising information which has been applied thereto by damaging material of the card by a laser beam.

The personalising information preferably but not essentially will include a representation of the cardholder and may also include a representation of the signature of the cardholder.

Where the personalising information has to be visually recognised, which will be the normal situation, then the invention involves the damaged material being discoloured by the laser beam to present said information in visible form. It has been found, for example, that this effect can be achieved by using a carbon dioxide laser of the type used for laser engraving work (e.g. a laser engraver as available from Zed Instruments Limited of Molesey Avenue, West Molesey, Surrey, England) into a plastics layer of white polyvinyl chloride or polyvinyl chloride/acetate copolymer, the result then being a brown image on the white background formed by the plastics material. Other plastics materials react similarly to a laser beam so as to give a visually recognisable image.

Thus the invention may involve making the personalising information integral with the plastics material of the card itself. The information is consequently extremely difficult to alter and in particular far more difficult to alter than in those earlier cases where the personalising information is on for example a photograph layer capable of being physically removed from the remainder of the card, and consequently of being substituted.

Difficulties in counterfeiting, and also in alteration of the card, are further increased by applying to the front surface of the card complex patterns such as Guilloche patterns or microprinting by means of security printing processes which in themselves are well known, and then laser engraving the personalising information into the surface which carries the printing. The laser engraving process then leaves parts of the printed security pattern present within discontinuities of the personalising information, for

example within those areas of a facial image which are light in tone, in which areas the laser engraving will leave the surface of the plastics card material and the security printing on it untouched. This intimate relationship between security printing and personalising information may also be achieved by applying both the security printing and the laser engraved information to a nonplastics (e.g. paper) layer as is referred to in more detail below.

It is preferred that the laser used in preparation of the card be a scanning laser which applies the personalising information in spaced lines. In this case, the spaces between the lines even through very small (the lines may for example be 100 to the inch) can nevertheless be sufficiently large for small parts of the security printing to remain there.

The personalising information may, for practical purposes, be covered by a transparent protective layer. This may be a layer of transparent lacquer or a protective layer in the form of an overlay which is permanently laminated to an underlying layer of the card, the underlying layer carrying the personalising information.

In cases where a transparent protective layer is employed, which is a common requirement, the invention may involve applying the personalising information to the underlying layer by directing the laser beam through the protective layer so as to damage the material below it. This can be achieved for example if the protective layer is of polypropylene which is transparent to visible light and hence does not obscure any underlying images, and also is transparent to CO2 laser radiation so that the laser beam goes through the polypropylene layer without substantially damaging it and forms the brown-coloured image previously referred to in the PVC base or core layer (or paper layer) lying below the polypropylene layer. The significance of this aspect of the invention lies primarily in that the physical structure of the identity card can be completely finished prior to the application of any personalising information, and consequently can be done at a single central highspeed manufacturing plant. The personalising information can then be applied on a more local basis by laser engraving machines which as already indicated can operate through the protective layer to produce the personalising information within the body of the completed card.

A further significant feature of the invention is that use of a laser beam to apply the personalising information to plastics material causes a form of damage which can be felt by the fingers, that is to say it has a tactile quality. This additional characteristic further increases the security of the identity card. In cases where the personalising information is to be covered by a transparent protective layer, this tactile quality might be substantially reduced or even lost but it is possible to avoid this by an appropriate constitution for the protective layer. For example some plastics materials such as polyester can be made visually transparent and yet to some degree opaque to laser radiation of an appropriate wavelength. Consequently such a layer will be damaged, in addition to any underlying layer, when exposed to the laser radiation and will give the desirable tactile quality to the surface of the card while at the same time a discoloured representation of the personalising information will be formed on a suitable layer under the protective layer. A damaged visually transparent overlay or protective layer will also have a characteristic optical effect upon the appearance of the underlying discoloured image and this further adds to the security of the identity card.

From another aspect, the invention provides a method of preparing an identity card carrying personalising information comprising taking a card component material which includes plastics material and subjecting the card component material to a laser beam capable of damaging the plastics materal while controlling the beam so as to damage the plastics material in a configuration which represents said personalising information.

From yet another aspect the invention provides a method of preparing an identity card carrying personalising information comprising completing the physical structure of the card including an internal layer and a transparent protective layer covering the internal layer, and applying the personalising information by directing radiation through the protective layer to cause a recognisable change of the internal layer in a configuration which represents said personalising information.

In order that the invention may be more clearly understood, a preferred embodiment and a preferred method of preparing it, will not be described with reference to the accompanying diagrammatic drawings, in which:

Figure 1 shows a front view of an identity card in accordance with the invention;

Figure 2 is a cross-section through a portion of an identity card in accordance with the invention which carries personalising information, on an enlarged and exaggerated scale; and

Figure 3 illustrates a process by which identity cards in accordance with the invention may be prepared.

Referring to Figures 1 and 2, Figure 1 gives an impression of the appearance from the front 2 of a laminated cheque guarantee card the cross-sectional structure of which is shown in Figure 2. The card comprises a base layer 4 of for example white polyvinyl chloride or polyvinyl chloride/acetate copolymer, a front overlay 6 of for example polypropylene transparent to visible light and a back overlay which is transparent like the front overlay 6 but is of polyvinyl chloride or polyvinyl chloride/acetate copolymer. Figure 2 also shows a magnetic stripe layer 10 but, as is well known, this will cover only a fraction of the area of the card whereas the other three layers extend throughout the entire dimensions of the card.

Figure 1 shows that, as viewed from the front, the card presents various visual features. These features are all present on the front surface 12 of the base layer 4. Firstly, there are features intended simply to identify the general nature and origin of the card, such as the words "Cheque Card" indicated at 14, the cash limit placed upon the card indicated at 16 and the identification of the bank by which the card is issued indicated at 18. This information is all

printed on the front of the base layer 4 during preparation of the card using conventional printing techniques and printing inks and, of course, before the front overlay 6 is applied.

Secondly, there are features whose purpose is to make the card difficult to counterfeit. Various features of this kind are conventionally used and in the card illustrated there are shown Guilloche patterns 20 consisting of a multitude of very fine looped and wavy lines which may be present in various colours and also microprinting indicated at 22. These features also are applied to the front surface of the base layer 4 using security printing techniques which are known in themselves and, in Figure 2, small parts of individual lines of the Guilloche pattern are indicated at 24.

The third type of information visible from the front of the card is personalising information which identifies the card with a particular individual who is authorised to use it and, in the case of a cheque guarantee card, whose authenticity should be ascertainable purely by visual inspection because of the circumstances in which it will be used. This personalising information is preferably in the form of an image of one or more features characteristic of the authorised holder of the card. In the present case, this image includes a representation 26 of the cardholder himself and a representation 28 of this signature. These images are formed into the front surface 12 of the base layer 4 by a laser engraving technique when in itself is known and which involves scanning the laser from left to right of the card as viewed in Figure 1, in a raster-like pattern at a line density of for example 100 lines per inch. During the scanning the laser beam is modulated in proporation to the desired tone of the image which typically varies along each line of the scan. The effect of the laser beam on the front surface of the base layer 4, when the latter is made of white polyvinyl chloride or polyvinyl chloride/acetate copolyer, is to cause damage in the form of chemical degradation accompanied by brown discolouration. The scale of the damage at any particular point is generally in proportion to the laser beam power, so it will be appreciated that each of the scanning lines by which the image is formed can vary from a maximum width corresponding to maximum laser power employed to zero width when the laser is modulated down to zero power in which latter case of course the surface of the base layer is not damaged at all. Accompanying the variations in scanning line width there will also be corresponding variations in the depth to which the plastics material is damaged.

The individual scanning lines have not been illustrated in Figure 1 but an attempt to illustrate them has been made in Figure 2 where they are shown in the form of grooves 30 of varying depths and widths. It should be realised that the precise microscopic form of the damage is not fully known and the grooves 30 as illustrated are only intended to be a rough approximation. By making the front overlay 6 of a material such as polypropylene which is transparent to and consequently not significantly damaged by radiation at the wavelength of the laser beam, the laser engraving of the personalising information 26 and 28 can be done on the front of the base layer 4 after the overlay 6 has been applied, that is to say the physical structure of the entire card can be completed, including the application of the Guilloche and any other security patterns, before the personalising information is applied to the card. During the laser engraving process, there is a tendency, which is more pronounced the thinner the overlay 6, for the overlay 6 to acquire deformations matching those being formed by damage of the surface of the base layer 4. This is a desirable characteristic because it gives the outermost card surface in the region of the images 26 and 28 a tactile quality which is an extra feature adding to the security of the card. This effect may be enhanced by making the overlay 6 of a material which at least to some extent absorbs the laser radiation, through being transparent at visible wavelengths, so that a certain amount of modification or damage is additionally caused in the material of the overlay. For this purpose, a visually transparent polyester layer may be used for the overlay 6.

An important feature of the card structure being described is that in the finished card the personalising information 28 and 26 is intimately associated with the security pattern printed on the front of the card. For example, referring to Figure 1, it can be seen that the lines of the Guilloche pattern remain intact on the light-tones portions of the image 26, for example on the forehead, cheek and chin areas. In Figure 2, the tow Guilloche lines 24 towards the righthand side of the finger lie in such an area, where no lines of laser damage are present. Further, it is possible for small portions of Guilloche lines to remain on the undamaged strips of card surface which lie between the lines of damage and two Guilloche lines 24 located in this fashion are shown near the middle of Figure 2. To the left of Figure 2 there are shown three Guilloche lines 24 which lie on a plane area of the base layer 4 outside the limits of the image areas, where the surface of the base layer 4 is continuously flat.

The rear overlay 8 and the magnetic stripe 10 are applied to the rear of the base layer 4 using any suitable known techniques during the manufacture of the card structure and prior to the application of any personalising information and, if desired, the rear surface of the base layer 4 may be printed with security patterns in similar manner to its front surface, before the rear overlay 8 is applied.

Figure 3 illustrates a method of production of personalised identity cards in accordance with the invention. At a card production station 32 which may be a central high-speed production facility, cards are produced using known techniques for printing the security patterns (for example in a matrix of perhaps 36 or 40 identical and complete patterns) on the base layer 4 which at this stage will be in sheet form, applying to both sides of the printed base layer the overlays 6 and 8, again in sheet form, applying the magnetic stripe 10 and then severing the sheet to produce a quantity of structurally complete identity cards which, though, carry no personalising information.

The personalising information itself may be gener-

ated, for example, at the individual branches of a bank. For a card of the type described it will be in the form of a photograph of the intended cardholder, a specimen of his signature, and probably two code numbers to be specifically associated with the individual cardholder, one of which is to be embossed in the material of the card and the other of which is to be encoded in the magnetic stripe on the back of the card. This information can be converted, using known techniques, into a machine-readable record containing all the personalising information. For example, the photograph and signature of the individual could be attached to a record card and the encoding details included as a punched hole pattern, or as OCR (optical character recognition) data or in the form of binary information contained in a magnetic strip supported on the card. This document would then be used to control the scanning laser engraver/encoding machines as shown in Figure 3 and described below. This stage of the process is represented in Figure 3 by the personalising information production station 34.

The remainder of the work stations shown in Figure 3 require a sufficiently low investment, and sufficiently readily available expertise, that they can be an in-house facility of the user, such as the bank, provided possibly on a regional basis. Stacks of physically complete identity cards will arrive at this facility from the central card production station 32 and the records from the bank branches will arrive from the personalising information production station 34.

The personalising information on each record which is required for the production of the images 26 and 28 on the identity card is read from the record by any suitable equipment and converted into a suitable form, using techniques which are known in themselves, for the control of the scanning laser engraver 36. An engraver of the type hereinbefore referred to can carry out the engraving process on an individual card fed to it from a stack in a time of approximately 10 seconds. The laser engraved card is then fed to an embossing station 38 where it is embossed with a code number which has been derived from the bank record by means of a reader 40 whose output information can be electronically converted using known techniques to a form suitable for controlling the embossing station. The embossed code number will typically be applied to the area of the card which carries the microprinting 22 in Figure 1. From the embossing station 38 the card is fed to a magnetic stripe encoding station 41 where its magnetic stripe is encoded with a further code number provided electrically from the reader 40. The card is next fed to a collator 42 where it is brought together with the related record fed forward from the reader 40 so that the original record provided by the bank branch, and the corresponding finished cheque guarantee card preparing from it are now together at the collating station 42 ready to be delivered back to the bank branch for use.

The desirability of completing the physical structure of the card at the central card production station 32 has been referred to, but is should be appreciated that alternatively the application of the front overlay 6 may be omitted at the central card production station 32 and the front overlay may then be applied on a card-by-card basis either immediately after the processing of the card at the engraving station 36 as illustrated at 44 or after the further embossing and magnetic stripe encoding stations as illustrated at 46.

As an alternative manner of preparing the bank records, the photograph and signature would be scanned and converted into digital data for storage on a continuous magnetic tape. As a complementary operation the encoding information would also be converted to a magnetic digital form and stored in an associated adjacent position on the same magnetic tape. Thus sets of information could be built up on the reel of magnetic tape and used for the continuous production of a batch of security cards in a manner which is still very similar but not identical to that indicated in Figure 3.

In an alternative sequence to that shown in Figure 3 the magnetic stripe encoding may be done before the embossing and preferably before the laser engraving, the information needed for the embossed number being magnetically encoded into the stripe. Then this encoded information can be used to directly control the embossing step, thus avoiding the need for a specific check of the number being embossed, against the related code number in th stripe, to ensure that they are correctly related (i.e. are both appropriate to the same card) at the embossing stage.

It should be appreciated that in principal the transparent protective layer on the front of the card, shown in the embodiment as being an overlay but which might alternatively be a lacquer layer, is not absolutely essential but in practice it is normally desired for the purpose of protecting the security printing from wear. However, by virtue of the intimate relationship between the laser engraved image and the security printing, which makes the former extremely difficult to alter without damaging the latter, the security aspect of an identity card as just described would be almost as good without the protective layer as with it.

In an alternative embodiment of the invention, the personalising information is formed by damaging a non-plastics layer with the laser beam. For example, a paper layer can be damaged by the laser beam so as to show the personalising information and can also carry security printing, so that the desirable intimate association between these two features may be achieved using a paper layer. Such a layer may be laminated into a card having the same general structure as is shown in Figure 2, between the base layer 4 and the protective layer 6. The security printing will be effected before the protective layer is applied but the laser engraving may be done afterwards. Both the printing and the laser engraving could, though, be done on the paper layer while it is separate from the other card components and advantageously while it is in continuous web form. The laser damage to a paper layer may be in the form of perforations, since a laser beam will penetrate thin paper. Visibility of the personalising information may then be enhanced by selecting

contrasting colours for the paper layer and an underlying layer. A paper layer may be of smaller dimensions than layers 4 and 6 so that firm plastics-to-plastics (or resin) bonding is achieved all round the margin of the card. Also the security printing may then run continuously from the paper layer on to the adjacent surface of the plastics base layer 4.

CLAIMS

1. An identity card carrying personalising information which has been applied thereto by damaging material of the card by a laser beam.

2. An identity card as claimed in claim 1, wherein the damaged material is discoloured by the laser beam to present said information in visible form.

3. An identity card as claimed in claim 1 or claim 2, wherein the personalising information comprises an image of one of more features characteristic of an authorised holder of the card.

4. An identity card as claimed in claim 3, wherein said image includes a representation of the card holder.

5. An identity card as claimed in claim 3 or claim 4, wherein said image includes a representation of the signature of the card holder.

6. An identity card as claimed in any preceding claim, comprising a complex pattern printed on the same side of the card so that to which said personalising information is applied.

7. An identity card as claimed in claim 6, wherein said personalising information and said printed pattern are both associated with the same layer of the card.

8. An identity card as claimed in claim 7, wherein said layer is a plastics layer.

9. An identity card as claimed in claim 7, wherein said layer is a non-plastics layer.

10. An identity card as claimed in any one of claims 6 to 9, wherein said personalising information has one or more discontinuities therein and parts of said printed pattern are present within said discontinuities.

11. An identity card as claimed in claim 10, wherein said discontinuities include areas of an image of one or more features characteristic of an authorised holder of the card which areas differ from adjacent areas in visual tone.

12. An identity card as claimed in claim 10 or claim 11, wherein said personalising information is formed from spaced lines caused by scanning of the laser and said discontinuities include the spaces between the lines.

13. An identity card as claimed in any preceding claim, wherein the personalising information is covered by a transparent protective layer.

14. An identity card as claimed in claim 13, wherein the protective layer is permanently laminated to an underlying layer of the card.

15. An identity card as claimed in claim 13 or claim 14, wherein the personalising information has been applied by directing the laser beam through the protective layer to damage material below that layer.

16. An identity card as claimed in claim 15, wherein the protective layer also is modified or damaged by said laser beam.

17. An identity card as claimed in any one of claims 1 to 16, which is also embossed with alphanumeric information.

18. An identity card as claimed in any preceding claim, wherein the material is damaged in such a way that the personalising information is sensible by touch on the outer surface of the card.

19. A method of preparing an identity card carrying personalising information comprising taking a card component material and subjecting the card component material to a laser beam capable of damaging the material while controlling the beam so as to damage the material in a configuration which represents said personalising information.

20. A method of preparing an identity card carrying personalising information comprising completing the physical structure of the card including an internal layer and a transparent protective layer covering the internal layer, and applying the personalising information by directing laser radiation through the protective layer to cause a recognisable change of the internal layer in a configuration which represents said personalising information.

21. An identity card as claimed in claim 1 and substantially as hereinbefore described.

22. A method of preparing an identity card as claimed in claim 19 and substantially as hereinbefore described.

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